

Serial No.: 09/975,870

Art Unit: 1724

Page 7

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated hereafter.

Claims:

1. (Previously amended) A species transfer device designed for communication with a first and second stream of a fuel cell, the device comprising:

(a) a housing assembly having a first stream inlet and outlet, and a second stream inlet and outlet; and

(b) an exchange matrix housed within said housing assembly, wherein the exchange matrix has an average linear coefficient of thermal expansion at 25 to 800° C of less than about $20 \times 10^{-7}/^{\circ}\text{C}$;

said housing assembly providing a path for said first stream of a fuel cell entering the first stream inlet, traveling through said exchange matrix and exiting the first stream outlet, and providing a path for said second stream of a fuel cell entering the second stream inlet, traveling through said exchange matrix, and exiting the second stream outlet;

said species transfer device capable of transferring a portion of a species from one of said first stream and said second stream to the other of said first stream and second stream, thereby conditioning said fuel cell streams.

2. (Original) The species transfer device of Claim 1, further comprising a sealing system.

3. (Canceled)

4. (Currently amended) The species transfer device of Claim 1, said exchange matrix being capable of rotation within said housing ~~enclosure~~ assembly.

Serial No.: 09/975,870

Art Unit: 1724

Page 8

5. (Original) The species transfer device of Claim 4, said exchange matrix being a cylinder of a porous material, said exchange matrix having a first and second end and a central core therethrough.
6. (Original) The species transfer device of Claim 4, said exchange matrix divided into fully segmented sections.
7. (Original) The species transfer device of Claim 4, said housing assembly further comprising a driving device capable of providing rotation to said exchange matrix.
8. (Currently amended) The species transfer device of Claim 1, wherein said exchange medium matrix having sorbent characteristics.
9. (Currently amended) The species transfer device of Claim 1, wherein said exchange medium matrix in combination with a sorbent.
10. (Currently amended) The species transfer device of Claim 1, wherein said exchange medium matrix is a magnesium aluminum silicate.
11. (Currently amended) The species transfer device of Claim 10 9, wherein said magnesium aluminum silicate is cordierite.
12. (Currently amended) The species transfer device of Claim 1, wherein said exchange medium matrix is at least 50% cordierite.
13. (Currently amended) The species transfer device of Claim 1 3, the exchange matrix media element being a unitary cylinder of exchange media.
14. (Currently amended) The species transfer device of Claim 1, further comprising an the enhancement technique being electrohydrodynamic enhancement technique.
15. (Currently amended) The species transfer device of Claim 14 4, the electrohydrodynamic enhancement technique being fluidic oscillation.

Serial No.: 09/975,870

Art Unit: 1724

Page 9

16. (Currently amended) The species transfer device of Claim 1 5, ~~comprising a the enhancement technique being media shuffling enhancement technique~~ further

17. (Original) The species transfer device of Claim 1, the device being a single-pass device.

18. (Original) The species transfer device of Claim 1, the device being a double-pass device.

19. (Currently amended) The species transfer device of Claim 5, further comprising a pressure equalizing system to reduce the pressure differences between active sections of the exchange matrix media, wherein active sections ~~of the wheel~~ are those sections of the exchange matrix media in flow communication with a stream.

20. (Currently amended) The species transfer device of Claim 2 4, the media exchange matrix element and sealing system being a unitary element being easily disposable.

21. (Original) The species transfer device of Claim 1, the first stream having a first potential of a first species and a second potential of a second species, the second stream having a lower potential of the first species than the first stream and a higher potential of the second species than the first stream, the species transfer device capable of transferring a portion of the first species from the first stream to the second stream and a portion of the second species from the second stream to the first stream.

22. (Currently amended) The species transfer device of Claim 1, said housing assembly enclosure having a third stream inlet and outlet, said housing ~~enclosure~~ assembly capable of providing a path for a third stream entering the third stream inlet, traveling through said exchange matrix, and exiting the third stream outlet;

Serial No.: 09/975,870

Art Unit: 1724

Page 10

said species transfer device capable of transferring a portion of a species from the first stream and the second stream to the third stream.

23. (Currently amended) The species transfer device of Claim 2, the sealing system comprising a labyrinth seal optionally used in conjunction with a sealing fluid injected into leak paths in the media exchange matrix.

24. (Currently amended) The species transfer device of Claim 2, the sealing system comprising a mattress assembly on either end of the exchange matrix media element, the mattress assembly providing a sealing relationship between the ends of the exchange matrix media element and end caps frictionally engaging the inside of the housing assembly enclosure.

25. (Currently amended) A species transfer device designed for communication with a first and second stream of a fuel cell, the device comprising:

(a) a housing enclosure having a first stream inlet and outlet, and a second stream inlet and outlet, and further having an inner surface;

(b) an exchange matrix element, said exchange matrix element having an average linear coefficient of thermal expansion at 25 to 800° C of less than about $20 \times 10^{-7}/^{\circ}\text{C}$ and being in the form of a cylinder having a first and second end, and a central core therethrough; and

said housing enclosure providing a path for said first stream of a fuel cell entering said first stream inlet, traveling through said exchange matrix element, and exiting said first stream outlet, and providing a path for said second stream of a fuel cell entering the second stream inlet, traveling through said exchange matrix element, and exiting the second stream outlet;

said first stream having a higher potential of a species than said second stream, said species transfer device capable of transferring a portion of the species from the first stream to said second stream.

Serial No.: 09/975,870

Art Unit: 1724

Page 11

26. (Original) The species transfer device of Claim 25, further comprising a sealing system, said sealing system discouraging interactions between the first and second streams as they flow in and out of said housing enclosure.

27. (Currently amended) The species transfer device of Claim 25, ~~media~~ the exchange matrix element being a plurality of cylindrically axial wedges insertable into a spoke carriage designed to secure such wedges.

28. (Currently amended) The species transfer device of Claim ~~26~~ 25, the sealing system comprising wagon wheel end caps located on either end of the ~~media~~ exchange matrix element, the end caps frictionally engaging the inside of the housing enclosure.

29. (Currently amended) The species transfer device of Claim 26, the sealing system comprising a spring loaded device to apply ~~the~~ a sealing force to sealing plates.

30. (Currently amended) The species transfer device of Claim 26, the sealing system comprising a labyrinth seal optionally used in conjunction with a sealing fluid injected into leak paths in the ~~media~~ exchange matrix element.

31. (Currently amended) The species transfer device of Claim 28, having said first and second end plates each incorporating at least two spokes, a center and an outer ring, each said spoke extending radially between the center and outer ring, said first and second end plates serving to cap the ends of said exchange matrix in order to provide a seal between said exchange matrix and the inner surface of said housing enclosure;

~~the first stream having a lower potential of the species than the second stream, the species transfer device capable of transferring a portion of the species from the second stream to the first stream.~~

Serial No.: 09/975,870

Art Unit: 1724

Page 12

32. (Currently amended) The species transfer device of Claim 31, the species being latent heat, and said further comprising a compression subassembly comprising a compression spring running through said central core of said exchange matrix, the ends of said spring being attached to the centers of said first and second end plates.

33. (Original) The species transfer device of Claim 31, the species being sensible heat, and said ends of said exchange matrix being provided with radially grooves extending from said core of said exchange matrix, said spokes of said end plates capable of fitting into said radial grooves wherein the number and orientation of said radial grooves match the number and orientation of said spokes of said end plates.

34. (Currently amended) The species transfer device of Claim 25, wherein said exchange ~~medium~~ matrix element is in combination with a sorbent.

35. (Currently amended) The species transfer device of Claim 25, said exchange ~~medium~~ matrix element is a magnesium aluminum silicate.

36. (Currently amended) The species transfer device of Claim 35, said magnesium aluminum silicate is cordierite.

37. (Currently amended) The species transfer device of Claim 25, said exchange ~~medium~~ matrix element comprising at least 50% cordierite.

38. (Original) The species transfer device of Claim 25, further comprising an enhancement system.

39. (Original) A species transfer device designed for communication with a first and second stream of a fuel cell, the device comprising:

(a) a housing assembly having a first stream inlet and outlet, and a second stream inlet and outlet; and

Serial No.: 09/975,870

Art Unit: 1724

Page 13

(b) an exchange matrix housed within said housing assembly, said exchange matrix comprised of a magnesium aluminum silicate having an average linear coefficient of thermal expansion at 25 to 800° C of less than about $16 \times 10^{-7}/^{\circ}\text{C}$;

said housing assembly providing a path for said first stream of a fuel cell entering said first stream inlet, traveling through said exchange matrix, and exiting said first stream outlet, and providing a path for said second stream of a fuel cell entering said second stream inlet, traveling through said exchange matrix, and exiting said second stream outlet;

said species transfer device capable of transferring a portion of a species from one of the first stream and the second stream to the other of the first stream and second stream.

40. (Currently amended) A fuel cell stream conditioning system comprising:

(a) a species transfer device, wherein the species transfer device contains and an exchange medium, wherein the exchange medium comprises a ceramic medium having an average linear coefficient of thermal expansion at 25 to 800° C of less than about $16 \times 10^{-7}/^{\circ}\text{C}$;

(b) a first stream of a fuel cell directed through the species transfer device; and

(c) a second stream of a fuel cell directed through the species transfer device;

said species transfer device transferring a portion of a species from one of said first stream and said second stream of a fuel cell to the other of said first stream and second stream of a fuel cell.

41. (Not Entered) The species transfer device of Claim 1, further comprising an enhancement system.